Centre Number	Candidate Number

Candidate Name _____

International General Certificate of Secondary Education
UNIVERSITY OF CAMBRIDGE LOCAL EXAMINATIONS SYNDICATE

PHYSICS 0625/6

PAPER 6 Alternative to Practical

Friday **28 MAY 1999** Morning 1 hour

Candidates answer on the question paper.
Additional materials:
Electronic calculator and/or Mathematical tables
Protractor
Ruler (30 cm)

TIME 1 hour

INSTRUCTIONS TO CANDIDATES

Write your name, Centre number and candidate number in the spaces at the top of this page.
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets [ ] at the end of each question or part question.
You may use a calculator.

FOR EXAMINER'S USE	
1	
2	
3	
4	
5	
TOTAL	

This question paper consists of 13 printed pages and 3 blank pages.

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[Turn over

1 Rays of light were reflected from the outside surface of a beaker that contained some water coloured with blue ink.

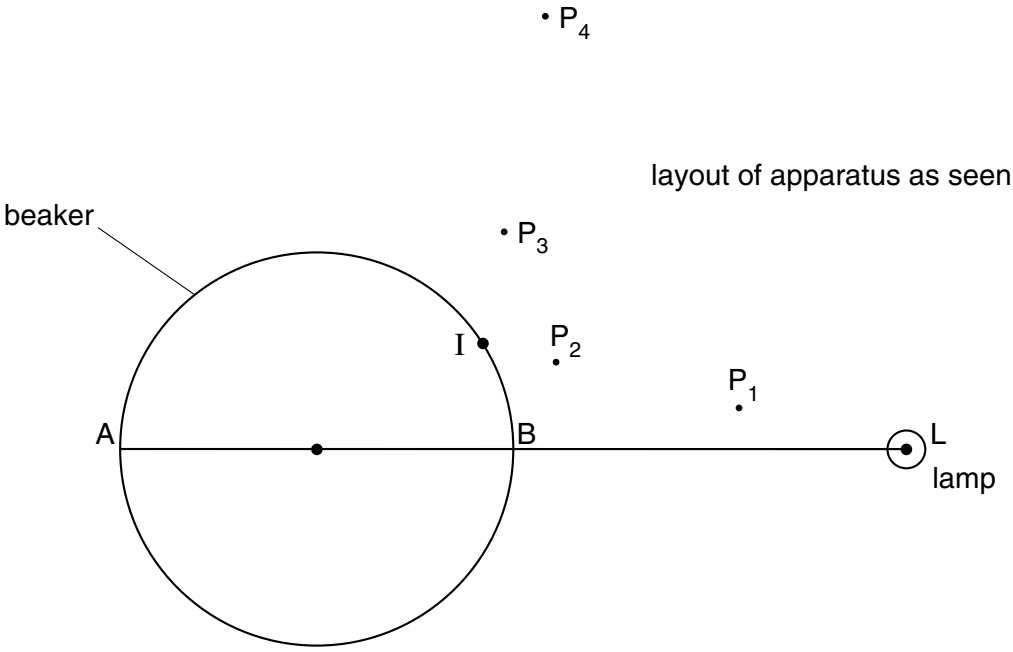

Fig. 1.1

The path of an incident ray LI, from lamp L, was marked by two pins P_1 and P_2. The reflected ray was located and marked using pins P_3 and P_4.

The diagram of Fig. 1.1 represents the beaker, the lamp and the pin marks.

(a) Complete the diagram by drawing lines to represent the incident and reflected rays. Label each ray. [3]

(b) Measure the angle between the incident and the reflected ray, call this angle *d* and record its value in the table. Also measure and record the angle *e* between the incident ray and the line AL. [2]

	angle / °
d	
e	

(c) Use your values of d and e to calculate a value for the ratio $\frac{d}{e}$.

$\frac{d}{e}$ = ... [1]

(d) **(i)** On Fig. 1.1, mark, with the letter E, the position where you would place your eye so as to see the lamp by the reflected ray.

(ii) Why is it an advantage to fill the beaker with coloured water when viewing the lamp by a ray reflected from the outside surface of the beaker? You may draw a diagram if you wish.

.....

.....

.....
[2]

2 The lever balance shown in Fig. 2.1 was constructed from a straw AB fitted with a pointer at one end and a piece of card. The balance was supported on a pivot and the straw set horizontal by adjusting the position of a small counterweight. The height of the pointer was measured by using a metre rule placed beside the apparatus.

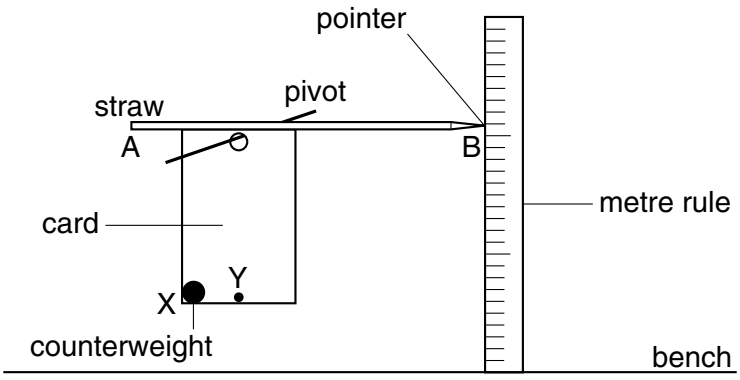

Fig. 2.1

(a) Describe how you would check that the metre rule was perpendicular to the bench. You may draw on Fig. 2.1.

.....

.....

..... [1]

(b) When the counterweight was placed at the corner X of the card, the straw was found to be horizontal. In the space below, draw a sketch of the straw to represent its position when the counterweight was attached at the point labelled Y, not X.

[2]

(c) With the straw horizontal, as shown in Fig. 2.1, a small paper clip was attached to the end A of the straw. The balance came to rest as shown in Fig. 2.2. Write down the reading shown for the height of the pointer B.

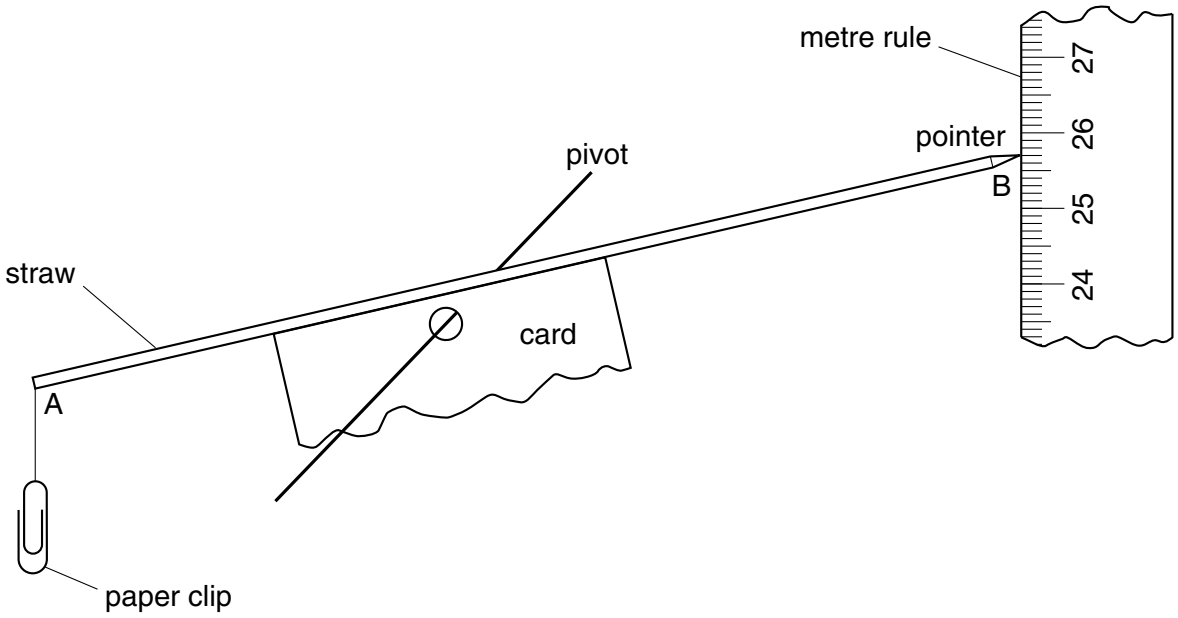

Fig. 2.2

pointer reading = ... [1]

(d) In one experiment, additional clips were attached to the end of the straw. The clips were added one at a time. After each clip had been added, the height *h* of the pointer was determined. Draw up a table in which you could record the values of *h* together with the corresponding total number of clips used. Your table should be suitable for use in your laboratory book.

[2]

(e) The distance *d* moved by the pointer, for each number *n* of paper clips hung from the balance, was calculated from the values of *h*. The graph of Fig. 2.3 represents the results of one experiment.

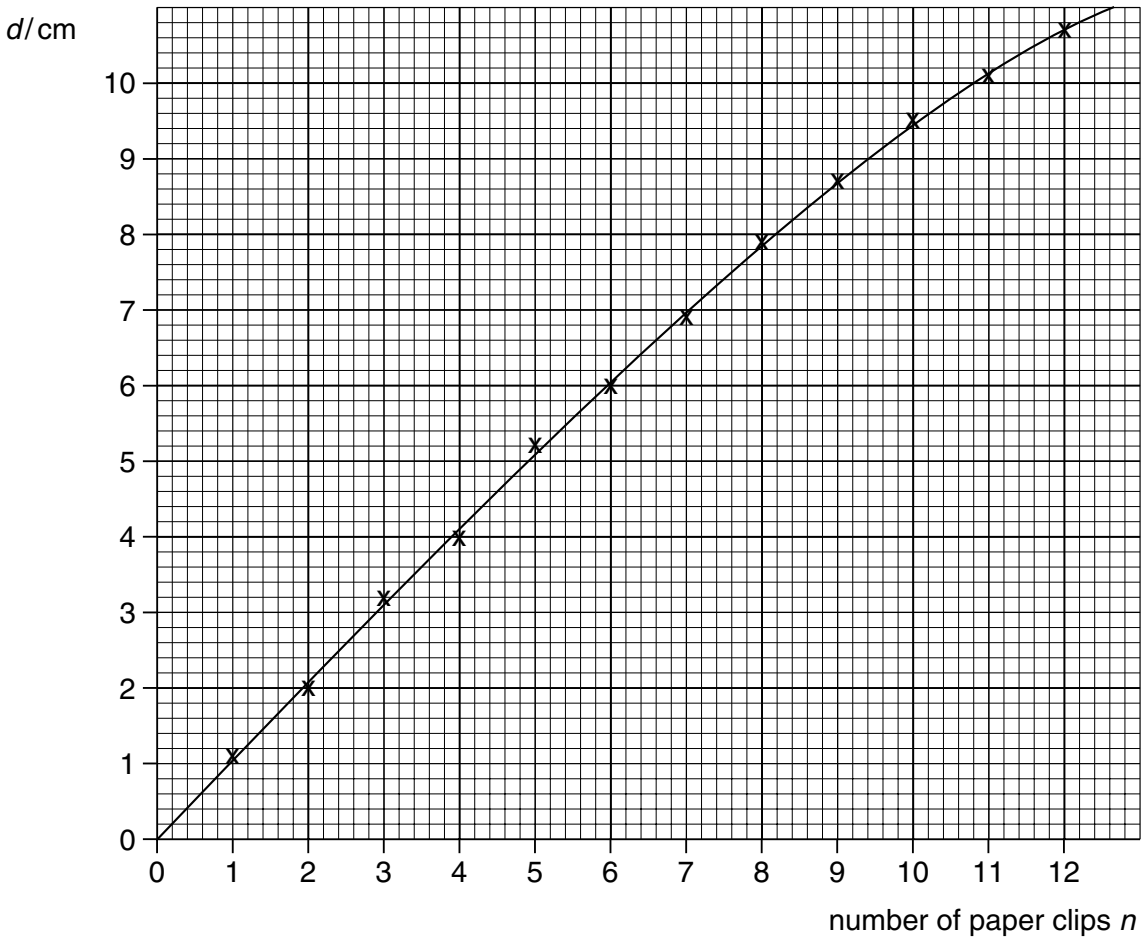

Fig. 2.3

The paper clips were removed from the straw and a small mass of plasticine was hung on the end A of the straw. The following information was obtained when this small mass of plasticine was in air and when it was totally submerged in water.

with the plasticine in air, the distance moved by the pointer $d_a = 9.1\,\text{cm}$
with the plasticine in water, the distance moved by the pointer $d_w = 4.6\,\text{cm}$

(i) From Fig. 2.3 determine the corresponding value for the number *n* of clips in use.

for $d_a = 9.1\,\text{cm}$, $n_a =$ .....

for $d_w = 4.6\,\text{cm}$, $n_w =$ .....

(ii) The values for n_a and n_w are not the same. As well as its weight, another force *F* is acting on the plasticine when it is submerged in water.

1. In which direction does *F* act? .....

2. Using the information you gave in **(i)** what can you say about the magnitude of *F*?

.....
[2]

3 An equal volume of water was placed in each of three similar test-tubes. The tubes were used in three experiments as described below.

Experiment 1

A small sheet of glass was placed on top of the tube and the apparatus turned upside down, as shown in Fig. 3.1. A strip of graph paper was held close to the tube and used as a scale.

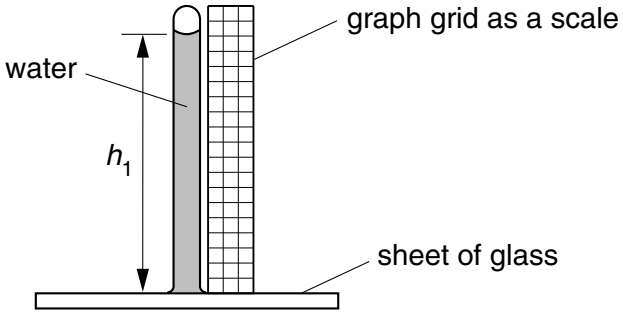

Fig. 3.1

The height h_1 of the water level above the glass was observed over a period of 5 hours. The observations are recorded in the table on page 8.

Experiment 2

The apparatus was similar to that for experiment 1. In addition, a piece of paper tissue was placed between the sheet of glass and the tube, as shown in Fig. 3.2. Once again, the height h_2 of the water level was observed over a period of 5 hours.

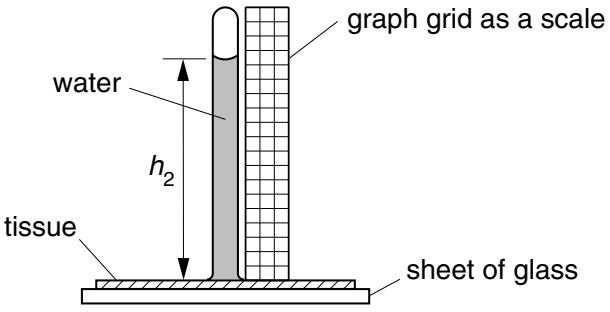

Fig. 3.2

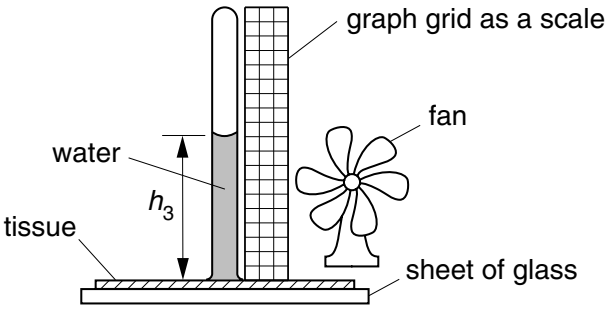

Fig. 3.3

Experiment 3

The apparatus was similar to that used for experiment 2. In addition, an electric fan was used to produce a draught over the surface of the tissue, as shown in Fig. 3.3. The area and shape of the tissue paper was the same as for experiment 2. Once again, the height h_3 of the water level was observed over a period of 5 hours.

The three experiments were conducted over the same 5 hour period. The temperature of the water was the same at the start of the experiments.

The observations are shown in the table.

time t / hour	room temperature θ / °C	height of water levels		
		glass	tissue	tissue + fan
		h_1 / cm	h_2 / cm	h_3 / cm
0	26.8	14.0	14.0	14.0
1	26.8	14.0	13.3	12.5
2	27.0	14.0	12.8	9.3
3	26.9	14.0	12.1	6.5
4	27.0	14.0	11.4	3.4
5	27.0	14.0	10.9	0.1

Fig. 3.4

(a) (i) Calculate an average value for room temperature θ during the 5 hour period.

average value for θ = ...

(ii) What was the largest difference between the average room temperature and the actual temperature of the room?

largest temperature difference = ...

Explain why it is reasonable to assume that the temperature of the room remained constant during the three experiments.

.....

.....

[3]

(b) **(i)** The area of cross-section of each tube was 2.0 cm^2. During the 5 hour period, what volume of water flowed out of each tube?

Experiment 1

volume = ...

Experiment 2

volume = ...

Experiment 3

volume = ...

(ii) Calculate the **average rate of flow** of water, in cm^3 per hour, from the tube during experiment 3.

rate of flow = ...

[2]

(c) Write a conclusion to the experiments. Your conclusion should explain why the three rates of flow are so different.

.....

.....

.....

.....

..... [3]

4 The circuit shown in Fig. 4.1 was used to determine *R*, the resistance of a resistor, using the equation

$$R = \frac{V}{I}.$$

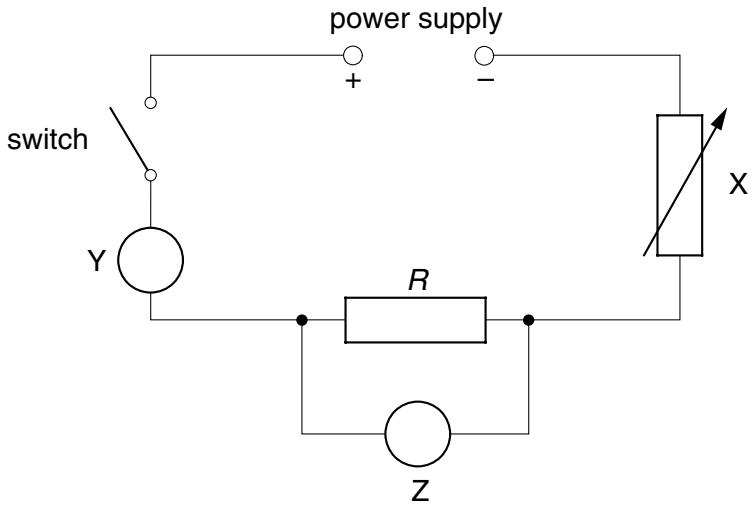

Fig. 4.1

The value for *R* is to be determined for different values of current *I*.

(a) Name the components labelled X and Y.

X .....

Y ..... [2]

(b) What is the purpose of the component X?

.....

..... [1]

(c) Explain how you would use the apparatus to determine values of *R*. Your answer should include what you would do before you close the switch.

.....

.....

.....

..... [4]

(d) The value of *R* is about 9.5 Ω and the current through it must not exceed 0.10 A. What would be a good choice for the maximum reading of the component labelled Z?

maximum reading = ... [1]

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Question 5 starts on page 12

5 A drinking straw was sealed at one end with candle wax. The straw was made to float upright in water by putting a small amount of ballast into the straw. The height of the top of the straw above the bench was determined. This height was called *h*, as shown in Fig. 5.1.

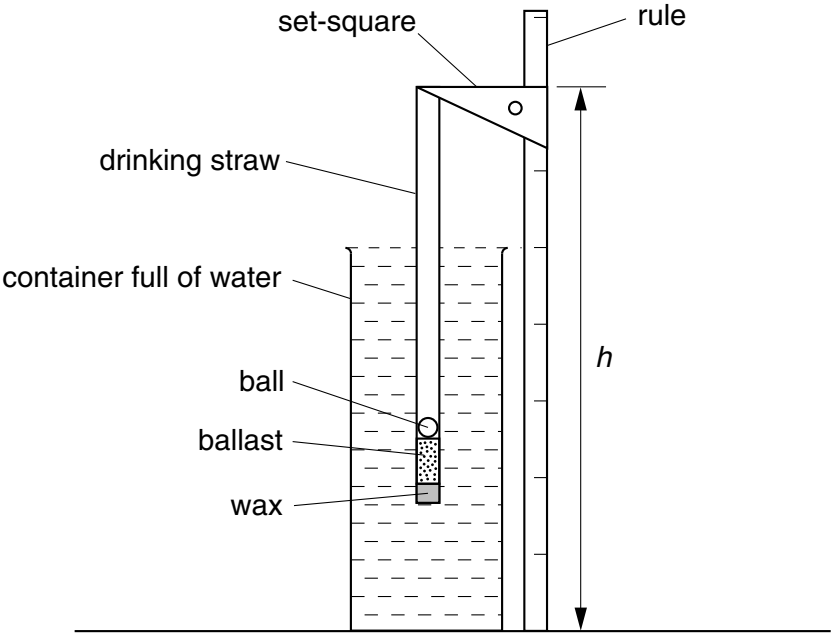


Fig. 5.1

A steel ball was put inside the straw and the new value for *h* was obtained. Additional balls were put in the straw one at a time. For each new ball the corresponding value of *h* was determined. Fig. 5.2 shows the values obtained.

number *n* of balls	0	1	2	3	4	5	6	7	8
h / cm	29.1	28.2	27.1	26.3	25.0	24.2	23.1	22.0	21.1

Fig. 5.2

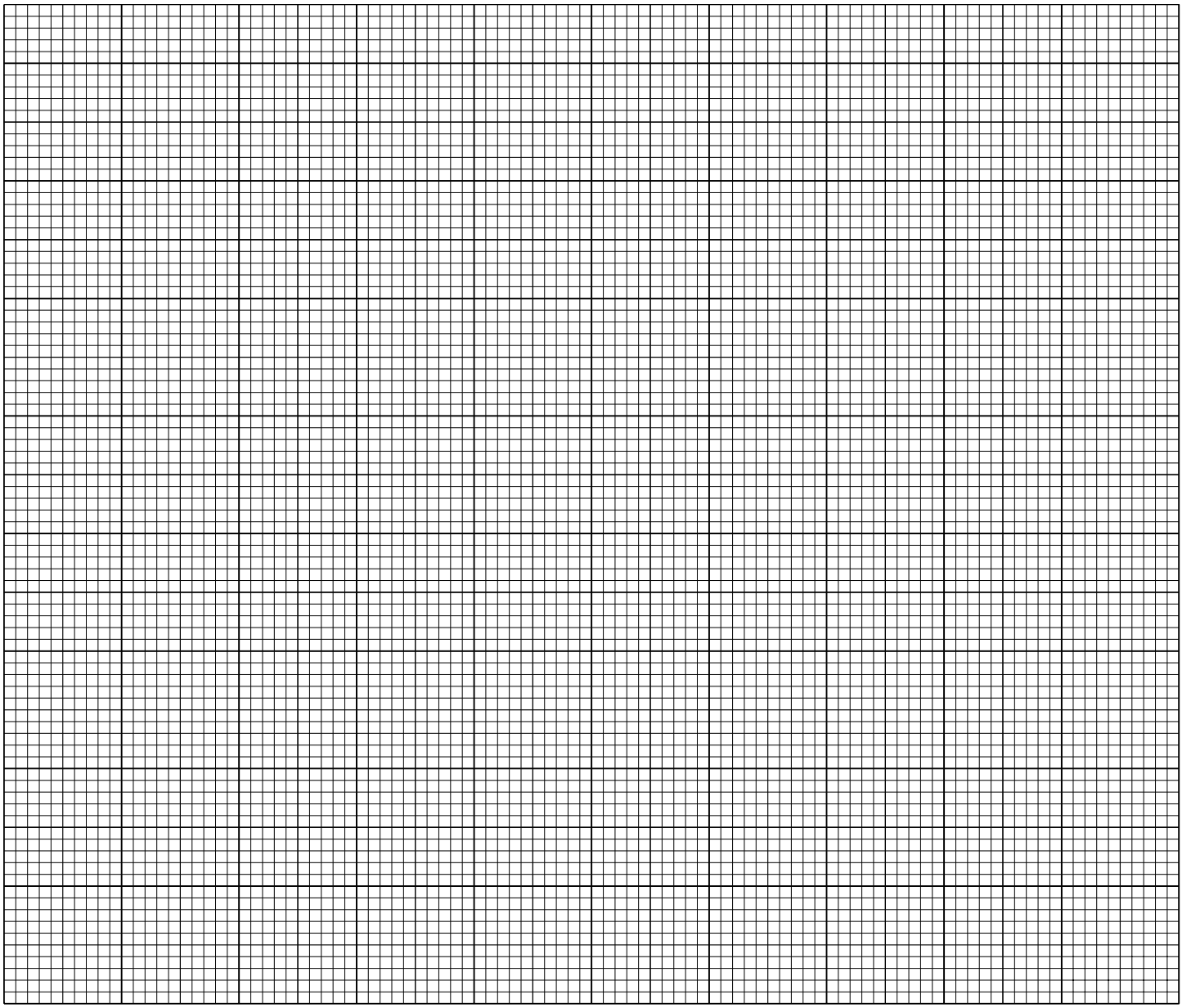
(a) (i) Plot the graph of *h* / cm (*y*-axis) against *n* (*x*-axis). Start your *y*-axis at *h* = 16 cm and make sure that your *x*-axis is scaled over the values *n* = 0 to *n* = 10.

(ii) Using your graph, estimate the value of *h* you would obtain if 10 balls were added. Show your working.

Mark the graph to show how you obtained this value for *h*.

h = ...

[4]



(b) Explain why the set-square is used when taking the reading for *h*.

.....

..... [2]

(c) Before taking the readings for *h*, one student pushed the straw down a little. The straw then moved up and down before coming to rest. Suggest a reason why this was done.

..... [1]

(d) The straw floats in the water so that its top is as high as possible. For this reason, the container was always full of water. Suggest what would happen if the container was not quite full so that the water surface was as shown in Fig. 5.3.

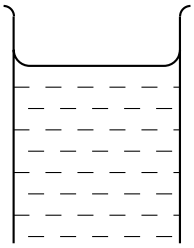


Fig. 5.3

..... [1]

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